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**"A CRITICAL ANALYSIS: OPERATIONAL SCHEME
AND JOINT THEATER MISSILE DEFENSE ATTACK CAPABILITIES"**

by

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A paper submitted to the Chairman, Joint Military Operations Department in partial satisfaction of the requirement for the Master of Arts Degree in National Security and Strategic Studies.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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ABSTRACT

Following the Gulf War in 1991, US military and civilian leaders identified significant shortcomings in the conduct of US Joint Theater Missile Defense (JTMD) operations and applied the lessons learned to improve the Joint Force Commander's (JFC) ability to execute such operations more effectively in the future. Four pillars of JTMD were doctrinally established: Passive Defense, Active Defense, Attack Operations, and C4I.

The scope of this paper is specifically limited to JTMD Attack Operations and related C4I capabilities which are designed to be employed against an adversary capable of launching ground-based theater missiles at US forces and/or their allies during a regional conflict. To be effective, procedural improvements and the execution of JTMD Attack operations cannot be implemented in a vacuum; they must be coordinated and integrated as part of a JFC's operational design. Thus, by using four integral elements of operational scheme as a framework of analysis, this paper critically evaluates the present/near-term effectiveness of JTMD attack systems and C4I capabilities to support and implement the JFC's overall operational design.

Recent joint doctrinal changes; vast technical upgrades in acquisition, attack, and C4I systems; and improved methodologies will enable the JFC to better plan, synchronize, and execute viable JTMD Attack Operations in the future. Challenges still exist, however, and must be overcome: vital C2 centers must be protected from external attack or system failures, military personnel need sustained training in JTMD technologies, and improvements in JTMD attack operations must be properly field tested and should always be developed in consonance with sound operational principles.

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INTRODUCTION

Who could forget the televised images of the incoming Iraqi ballistic missiles during the Persian Gulf Conflict in 1991? Moreover, who could forget sharing the almost helpless feeling of the intended victims shielded only by luck and the newly-devised anti-missile capability of the US Army's Patriot system? Perhaps most frustrating, however, was the inability of the coalition forces to effectively find and eliminate Saddam Hussein's ground-based, surface-to-surface launch capabilities. Although the Iraqis launched 88 Scuds at military and civilian targets in Saudi Arabia and Israel, 4800 coalition air force sorties failed to accurately locate and destroy even a single enemy missile launcher.¹ The hard lesson learned, however, was not lost by US military leaders and the National Command Authority.

New joint doctrine formalized between 1993 and 1995 provided the Combatant Commanders/Joint Force Commanders (JFCs) and military department leaders with a mandate that challenged them to specifically make Joint Theater Missile Defense (JTMD) a viable and lethal means to thwart the growing threat posed by potential adversaries armed with ballistic missiles. The updated doctrine established four, mutually-supporting pillars of JTMD as follows: Passive Defense; Active Defense; Attack Operations; and Command, Control, Communications, Computers, and Intelligence (C4I). Respectively, these pillars provide the combatant commander with the doctrinal concept to: minimize the effects of a theater missile (TM) attack; intercept and destroy in-flight missiles; neutralize or destroy an adversary's ability to produce, deploy, or employ TMs; and establish and operate the C4I system required to

coordinate and integrate the joint force component's overall TMD capabilities.² Although the Passive Defense and Active Defense pillars are recognizably integral components of JTMD, the scope of this paper will be limited to JTMD Attack Operations and related C4I capabilities which are designed to be employed against an adversary capable of launching ground-based theater missiles at US forces and/or their allies during a regional conflict.

Joint Publication 3-01.5 defines JTMD Attack Operations and C4I as follows:

Attack Operations: to destroy, disrupt, or neutralize TM launch platforms and the supporting command, control, and communications (C3); logistics structures; and reconnaissance, surveillance, and target acquisition (RSTA) platforms. Attack operations include offensive action by air, land, sea, space, and special operations forces.

C4I: is an integrated system of doctrine, procedures, organizational structures, facilities, communications, computers, and supporting intelligence. C4I provides command authorities at all levels with the timely and accurate data and systems to plan, monitor, direct, control, and report TMD operations.³

By concentrating primarily on these two JTMD pillars, this paper will identify and assess the current and near-term joint operational functions and capabilities which are intended to improve the JFC's ability to defeat a potential adversary's ground-based TM forces and support infrastructure.

ESTABLISHING A FRAMEWORK OF ANALYSIS

Inspired by increased budgetary funding for JTMD and governmental impetus provided by the Ballistic Missile Defense Organization's (BMDO) oversight, the most recent design upgrades and improvements in JTMD Attack Operations have been made possible through vast technological advancements in C4I and attack systems capabilities. Although woefully necessary, one must ask if these

technological improvements are sufficient to achieve operational success. Since joint doctrine directs that all future JTMD missions should be coordinated and executed as part of the theater campaign plan and in concert with overall operations⁴, it becomes vitally important to investigate if the tenets of operational art are being properly applied to and effectively met by the current developments and improvements of this critical joint mission requirement. More specifically, it is crucial to determine if the integral elements of operational scheme confirm present/near-future JTMD Attack Operations design or if changes should be considered to correct for potential operational flaws or to account for a possible "over-reliance" on improved technologies alone. If not firmly based on sound operational principles, once implemented, future JTMD Attack Operations could possibly fail the combatant commanders again; this time with perhaps more disastrous results and long-term negative effects than were realized in early 1991.

In order to establish a valid framework to critically evaluate JTMD Attack Operations and associated C4I capabilities, it is first and foremost necessary to define operational design and reveal the significance of operational scheme as it applies to critical theater operations such as JTMD.

A combatant commander's operational design "...exists to ensure that one's own forces and assets are employed in a coherent manner, focused on the assigned operational or strategic goals in theater".⁵ Of the ten subordinate elements of operational design (which include such principles as guidance, objectives, desired end state, and the enemy's critical factors), operational scheme is further defined as "...the essence of operational design [because

it] must portray the broad vision of *what* the operational commander intends to do and *how* he intends to do it".⁶ Perhaps most important, however, the JFC must have at his disposition the viable means to effectively implement and fulfill the critical *what* and *how* of his operational scheme. Without such integrated warfighting capabilities, the JFC's operational design will most likely fail and his overall objectives will be extremely difficult to achieve.

In the specific case of JTMD Attack Operations and related C4I capabilities, there are four integral elements of operational scheme that, when selected and used as an analytical framework, serve best to assess the possible effectiveness of these attack systems and capabilities as a viable means to support and implement a JFC's overall operational design. These fundamental elements are: Application of Forces and Assets; Synchronization; Coordination; and Operational Fires.⁷

APPLICATION OF FORCES AND ASSETS

This integral element of operational scheme can serve to broadly evaluate how well our command structure and forces are prepared to effectively determine which JTMD attack systems and assets should be used to achieve theater objectives. As a first important step, new joint doctrine explicitly delineates JTMD command responsibilities as follows:

The Theater Combatant Commander establishes theater guidance and objectives for JTMD and assigns and/or apportions forces and resources... [while]...the JFC establishes guidance and objectives for the: JTMD methodology and joint planning, priority of JTMD effort, defin[ing] the area of operations (AO) of components, apportionment, capabilities/forces made available to the functional components, guidance for coordination to facilitate deconfliction for timely TMD operations, role of the JFC staff, and degree of [responsibilities of the] Joint Targeting Coordination Board (JTCB) for TMD.⁸

Therefore, the joint commander is now specifically empowered and expected to clearly determine how selected forces/assets will be organized and used to execute JTMD missions and in what manner or priority such resources will be employed in the AO. In this regard, the new joint doctrine has significantly improved the ability of the JFC to plan, organize, and conduct more credible JTMD operations than in the recent past.

Determining the main and secondary effort and allocating the appropriate forces and assets to achieve the overall objectives during each phase of a major operation or campaign is generally the most common dilemma facing any joint commander. This is particularly difficult for the JFC who also has been assigned a JTMD mission because virtually no weapons or acquisition platforms exist in any of the military services to specifically perform a *dedicated* role in JTMD attack operations. Due to the time-sensitive nature of JTMD attack operations, once identified for JTMD missions, these assets (such as specific Army missile systems, Air Force fighters, Navy cruise missiles, and theater-level surveillance radars) cannot be readily diverted to other tasks without seriously jeopardizing the success of their original JTMD mission. Therefore, unless the JFC is provided systems specifically earmarked or fenced for his JTMD mission, he and his staff must still conduct extensive intelligence estimates and risk analyses to determine which assets (by type, number, and service) will be required to respectively accomplish JTMD and non-JTMD objectives. Today, there are various automated C4I systems which are being designed and jointly tested to do just that.

For example, the Air Force is presently testing an Integrated

Battle Intelligence Server (IBIS) which predicts and disseminates the "most likely" subsequent launcher locations for follow-on friendly targeting while the Army's Automated Deep Operations Coordination System (ADOCS) receives and processes such intelligence and uses its weapons-paring program to select, warn, clear, and order the most appropriate Army weapon systems to conduct timely attacks against such high priority targets.⁹ Most important, these systems do not replace the decision-making capability of the JFC; they are designed to supplement such processes with a more efficient means to designate and apply the forces required to effectively execute JTMD attack operations.

Perhaps an even greater challenge facing the joint commander tasked to execute JTMD attack operations is the inherent requirement to employ a joint command and control structure which can effectively link national/theater collection assets (strategic/operational level) to the specific joint attack systems (tactical level). Due to the "fleeting" nature of most TMD ground-based targets, this linkage must be efficient enough to operate within the enemy's decision cycle and drastically reduce the time it would take to actually acquire, select, and destroy TM targets.

In recent years, the Department of Defense and the military services (both unilaterally and collectively) have responded well to the planning and execution needs of the combatant commanders/JFCs in this area. The Army Space Command TMD Element fielded a prototype of the Army TMD Force Projection Tactical Operations Center (FPTOC) [Figure 1] while the Air Force developed its complementary Combat Integration Capability (CIC) operations center [Figure 2]. Both centers are designed to be employed

separately or jointly as part of the regional JFC's battle staff to provide both the critical fusion of TM-related intelligence and friendly operational information and to assist the JFC in determining the proper apportionment or application of TMD attack forces and C4I assets.¹⁰ In April-May 1995, these two centers proved their functionality, interoperability, and operational value for future JTMD employment during Exercise "ROVING SANDS", which is conducted annually at Fort Bliss, Texas and the White Sands Missile Range, California¹¹ [Figure 3]. Additionally, given its shift in emphasis toward littoral operations and the fact that its ships will most likely be the first C2 "platforms" initially available during future regional crises, the Navy is currently evaluating and testing its own role in hosting JTMD C2 centers afloat.¹² Such improved tri-service capabilities can provide the JFC with greater operational flexibility and the required lethality to achieve/maintain battlespace dominance during both the seaward and landward phases of near-term JTMD-supported operations.

In recent years, the joint staff and the respective services have rapidly responded to the requirement to develop and provide dedicated JTMD C2 centers to effectively support the JFC's overall operational design in a time of crisis. Further, new joint doctrine and C4I automated systems are now being fielded and continue to be operationally tested to better enable the JFC to properly and efficiently allocate his JTMD attack assets and capabilities to best achieve his desired operational objectives. Next, it is important to evaluate how effectively the JFC could synchronize his selected JTMD attack assets and capabilities if employed against an adversary's TM forces or infrastructure.

SYNCHRONIZATION

Effective synchronization is vital for successful JTMD Attack Operations. As part of a JFC's operational design, synchronization is best defined as "...the arrangement of military actions [by one's own forces] in time, space, purpose to produce maximum relative combat power at a decisive place and time..." [and it is achieved by] ..."establishing proper command relationships, having a joint concept of operations, and assigning clear and militarily realistic tasks."¹³ Recognizing that a lack of viable synchronization was a major shortcoming in the coalition forces' effort to defeat Iraq's TM threat during the Gulf War, US military leaders have since published new joint doctrine which provides specific requirements for maximizing interoperability and improving procedures for JTMD operations. In recent years, such doctrinal emphasis, military leaders' resolve, and increased funding have all generated the needed impetus to better arm the JFC with the means to more effectively plan, posture, and commit his selected forces and assets in support of JTMD Attack Operations.

The first area affected by such improved emphasis is the establishment of command responsibilities within the theater. Although the JFC is ultimately responsible for JTMD planning and synchronization, joint doctrine affords him the flexibility to delegate the actual conduct of operations to his subordinate joint commanders. During a regional conflict, a JFC normally designates respective surface AOs within which each of his component commanders are responsible for attack operations. However, since JTMD Attack Operations may have to be executed theater-wide, Joint Publication 3-01.5 further recognizes the primacy of the Joint

Force Air Component Commander (JFACC) to "...plan for and maintain visibility on the wide attack operations effort..." [and that] "...beyond the surface AOs, the JFACC is normally designated as the supported commander for attack operations".¹⁴ This recent doctrinal clarification serves well to better establish critical command responsibilities which were not well defined in the past.

Although there have also been noteworthy technical and tactical improvements in the collection and attack systems that can be used to support JTMD operations, the military services (unilaterally and jointly) have perhaps demonstrated their greatest recent achievements in the area of C4I. Like the Army's FPTOC and the Air Force's CIC mentioned earlier, the Navy is further developing its own Cooperative Engagement Capability (CEC). The CEC will enable better fusion and timely coordination among its sea-based decision-makers, planners, collectors, and attack systems to provide the JFC with a more lethal precision strike capability from the sea.¹⁵ Each of these center's technical capabilities and re-defined C2 procedures for JTMD are designed to improve the staff's unity of effort, deconflict and coordinate actions, and exploit the robustness and rapid processing capabilities of integrated and automated systems. Some of the critical functions which will be common to all of these centers include: communication of orders and commander's priorities; intelligence processing and information exchange; status/readiness of own assets; joint targeting coordination and information dissemination; battlespace deconfliction and airspace coordination; and standardized reporting procedures. These improved capabilities support revised joint doctrine which specifically recognizes that dedicated, functional

C4I systems such as these are essential for providing the necessary vertical and horizontal technical and procedural interoperability for future JTMD operations.¹⁶ These improved systems, employed in joint C2 centers, can provide a more effective bridge between various collection platforms and joint attack systems; a critical pre-requisite for the effective execution of time-sensitive operations such as JTMD Attack Operations.

The rapid development of such improved technical systems and revised joint and related service-specific procedures, however, do not come without a price. Due to the "developmental" status of many of these C4I systems and related methodologies, they are still often tested in service-specific battle labs or as "add-on" field experiments conducted in conjunction with joint exercises. In many cases, the interoperability and sustainability of such C4I technologies still greatly depend on the physical presence of technical experts and civilian contractors to keep the systems operating and to actively assist the military "users" selected to test-operate them.¹⁷ Moreover, due to the high costs of conducting actual "tactical" exercises and the Armed Forces' personnel rotation policies today, fewer and fewer opportunities exist to ensure that the future military operators of these systems will gain the necessary hands-on experience and training in the coordination and synchronization of actual JTMD combat assets. Simulation exercises can serve very well to plan and practice JTMD attack procedures; however, they cannot exactly replicate the challenges of establishing and maintaining constant interoperability among actual joint assets and attack systems. To correct for these apparent shortcomings, military leaders and

JTMD systems developers should maximize the integration of "user-friendly" software programs into C4I systems and continue to include military operators in all future TMD experiments. The results of these tests should also be well-documented and readily disseminated in the form of "lessons learned" and "draft training manuals" for review and comment among those military organizations earmarked for possible TMD missions.

The joint staff and the military services have made significant doctrinal, technical, and operational improvements to provide the JFC with greater ability to effectively synchronize future JTMD Attack Operations. In the future, however, a fine balance must continuously be struck between rapid improvements in technology and methodologies and the requisite readiness of military personnel to remain adequately trained to operate such emerging systems. If this balance is properly maintained, the JFC will be effectively armed with his selected collection assets/attack systems and viable JTMD C2 centers that can process and synchronize his overall operational effort. He will then be challenged by the requirement to ensure that his JTMD Attack Operations are properly coordinated throughout the AO.

COORDINATION

At the operational level, coordination is particularly challenging for the JFC because it refers to those actions which are necessary to harmonize the overall national/multinational political-military objectives within the theater or designated region.¹⁸ As witnessed during the Gulf War, the requirement to defend against and destroy the Iraqi surface-to-surface missile capability went well beyond simple military necessity; the

political nature of such Iraqi attacks could have readily instigated a possible rupturing of the coalition with devastating results. Thus, using selected staff members (J3/J5) and liaison personnel supplied with satellite communications and equipment, a JFC can now more actively interface with supporting military and regional civilian authorities to prioritize, synchronize, and deconflict his JTMD operational design. These liaison personnel serve an essential function because multinational forces and host nation assets may be able to augment and complement US joint capabilities while, at the same time, significant differences in respective national objectives and the technical level of their C4I systems may actually complicate the JFC's ability to execute his planned operations.¹⁹ US joint forces may also be the only military force employed in a future regional conflict that is capable of conducting viable JTMD Attack Operations. Therefore, the JFC may ultimately be assigned the responsibility to ensure that such operations are effectively coordinated at all levels throughout the entire AO.

Because each region is unique and the political-military nature of any future conflict is extremely difficult to predict, it is perhaps impossible today to assess how well a JFC could actually affect future JTMD coordination at the operational level. It is possible, however, to simply recognize that present and near-term JTMD C2 centers, augmented and supported by qualified liaison personnel, can provide the JFC with the improved practical means to coordinate such critical operations. Moreover, newly-revised doctrine and lessons learned dictate the absolute need to militarily and politically deconflict all regional operations.

Once the JFC's forces are properly selected and organized, his JTMD C2 centers capable of synchronizing the effort, and his overall political-military goals and objectives coordinated, the JFC will be better able to more effectively use his operational fires to decisively defeat an adversary's TM forces and infrastructure.

OPERATIONAL FIRES

This final element of operational scheme serves to evaluate the effectiveness of joint attack systems and related C4I capabilities to specifically acquire, process, and doctrinally engage enemy TM forces and supporting infrastructure. In order to achieve a decisive impact on the outcome of his regional operations, a JFC may use operational fires to destroy specific enemy facilities and functions to "...neutralize or substantially degrade critical enemy operational capabilities".²⁰ Given a JTMD mission that includes the defeat of the adversary's TM threat, the JFC may decide to use operational fires to achieve this objective as a part of, or in support of, his operational design.

Presently, the US forces possess a wide array of intelligence collection and processing systems that, when employed correctly and rationally, can detect, track, and provide mutually-supporting means to target enemy TM assets. These include capabilities such as national satellites, the Joint Surveillance and Targeting Radar System (JSTARS), SPY-1 radars, Unmanned Aerial Vehicles (UAV), counterfire radars, and special operations forces (SOF). With improved navigational technologies and secure communications systems, stationary targets (such as launcher resupply points) can be accurately located to within a few meters and the data can be transmitted within seconds to a JTMD C2 center for analysis,

synchronization, and possible attack. Moving forces/systems can also be tracked by many of these assets; however, there is still great difficulty in decisively attacking targets (such as Scud launchers) that are capable of rapid displacements. As such, there is now added emphasis for joint intelligence platforms to locate and target TM support infrastructure as well as the more elusive missile launchers.²¹ Through their effective employment and with continued improvements in accuracy and timeliness of data transmissions, joint acquisition assets can provide the JFC with a more viable capability to monitor and target enemy TM forces within his assigned battlespace.

To properly use centralized planning and decentralized execution methodologies, the data gathered by the numerous acquisition assets must be channeled through highly-automated, efficient JTMD C2 centers for processing and decision. Although the new C4I systems within these centers offer unique capabilities not previously available to the JFC, they are not without significant vulnerabilities. Their sheer electronic signature make the centers lucrative targets for enemy attack. Moreover, these C2 centers are now more dependent on satellite communications between sensors, "shooters", and adjacent commands. Thus, any effective jamming or damage to ground station transmitters/receivers at any critical node could hamper the required timeliness of JTMD "sensor-to-shooter" attack sequences and coordination.²² Also, due to the interdependence of the various C4I systems configured within these C2 centers and among the other command centers supporting the JTMD mission, a single system failure or operator error can cause inaccuracies and delays throughout the entire integrated system.

The JFC's staff must take proactive measures to protect these critical centers from attack and from the inherent vulnerabilities of such highly-integrated, automated systems. By doing so, these improved C4I systems configured within dedicated JTMD C2 centers will be able to more readily provide the precise and rapid data processing required for effective JTMD Attack Operations.

Significant upgrades continue to be made in the joint weapons systems and delivery methods identified for use by the JFC in attacking ground-based TM forces and support infrastructure. The Army has focused its efforts on increasing the Army Tactical Missile System's (ATACMS) range out to 300KM, improving its lethality against moving targets (Block II, Brilliant Anti-Tank submunitions), and streamlining its tactical employment techniques (referred to as "posturing") to reduce the time it takes to execute high-priority TMD fire missions.²³ The Air Force is presently experimenting with transmitting real-time images of selected objective areas directly to the cockpit of pilots who are enroute to attack mobile targets such as missile launchers.²⁴ The Navy, for its part, has concentrated its efforts on improving the Tomahawk system "Precision Strike Capability" by extending its range out to 1000 nautical miles, integrating Global Positioning System (GPS) capabilities on its Block III platforms, and increasing the number of vertical launch missile cells in the future surface fleet.²⁵ When integrated with effective acquisition platforms and efficient, automated JTMD C2 centers, these tri-service delivery capabilities serve to demonstrate just a few of the many emerging technical and tactical improvements that could provide the JFC with more viable means to decisively use

operational fires decisively to fulfill his specific JTMD attack requirements and his overall operational objectives.

CONCLUSION

Shortly after the Gulf War, the US National Command Authority and senior military leaders published joint doctrinal changes and instituted budgetary support to improve the nation's capability to plan, integrate, and execute more viable JTMD operations. Moreover, the failure of the coalition forces to decisively engage and destroy Iraqi ground-based TM delivery systems specifically prompted joint and service-specific research and testing to address and correct shortcomings identified in joint C2 organization; mission processing methodologies; and the technical capabilities of US acquisition assets, weapons platforms, and related C4I systems.

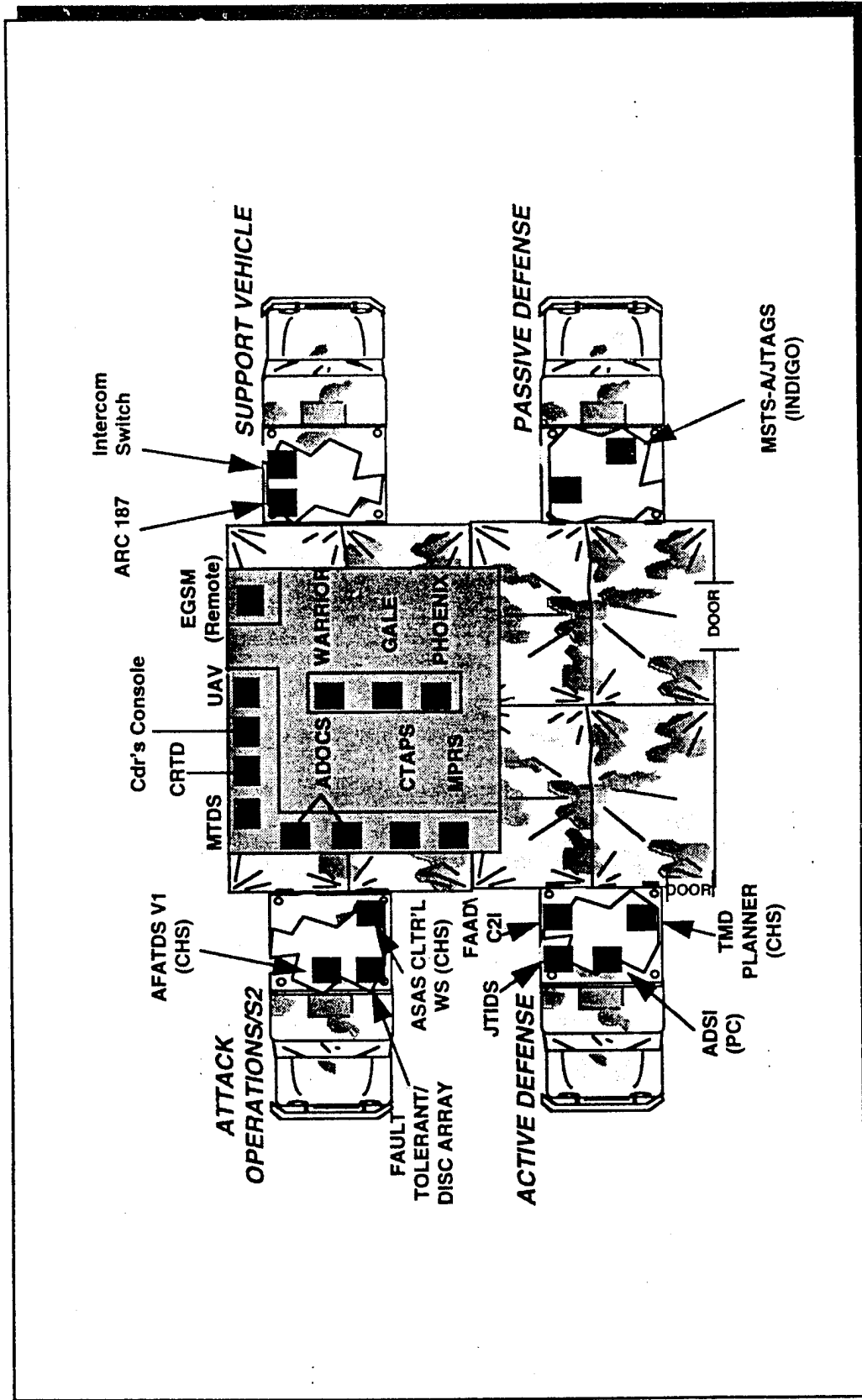
Like any other military action, JTMD Attack Operations cannot be implemented in a vacuum. They must be coordinated and executed as part of, or in support of, a future JFC's overall operational design. Furthermore, these improved capabilities must be able to provide the JFC with the viable warfighting means to effectively fulfill and complement the *what* and *how* requirements of his selected operational scheme.

Using the most applicable integral elements of operational scheme, this critical analysis revealed that the JFC is presently being armed with valid joint doctrinal changes; vast technical upgrades in acquisition, attack, and C4I systems; and improved attack methodologies and mission processing procedures to better plan and execute viable JTMD Attack Operations. Using such capabilities and in accordance with the key tenets of operational art, he can now more efficiently select and organize his assigned

forces and assets; synchronize the overall joint/combined effort; capitalize on the reinforcing effects of the various systems employed; and better coordinate his critical operations throughout the regional AO. Whether in support of, or in conjunction with, his overall operational design, the future JFC will be better able to employ his joint assets to deliver decisive operational fires and precision strikes against high-priority, critical TM targets.

Rapid technological improvements, a greater dependence on joint synchronization and coordination, and procedural changes at the operational and tactical levels do present some difficult challenges for the future JFC required to conduct JTMD Attack Operations. The highly-vulnerable JTMD C2 centers must be adequately protected from external attacks or system failures and the military personnel using such integrated, automated systems must be properly trained to independently install, operate, troubleshoot, and maintain these critical C4I capabilities. Both unilaterally and jointly, the military service leaders should continue to field test their present and emerging capabilities under the most realistic and stressful conditions possible and they should strive to ensure that JTMD improvements are developed in consonance with sound operational principles. By doing so, the JFC will ultimately be better served by being provided not only the best technical means available but also the trained personnel and proven methodologies to execute such critical JTMD Attack Operations in support of his overall operational design.

FP TOC Configuration for JWID



MITRE

JWID: Joint Warfare Interoperability Demonstration
 MTDS: Multi-link & Translator Display System
 CRTD: Commander's Real Time Display
 GALE: Generic Area Limitation Environment
 PHOENIX: C2 Support System

ADDCS: Automated Deep Operations Coord System
 MPRS: Msn Planning & Rehearsal System
 AFATDS: Adv FA Tactical Data System
 ASAS: All Source Analysis System
 JTIDS: Joint Tactical Info Distro System

Figure 1

Air Force Combat Integration Capability (CIC)

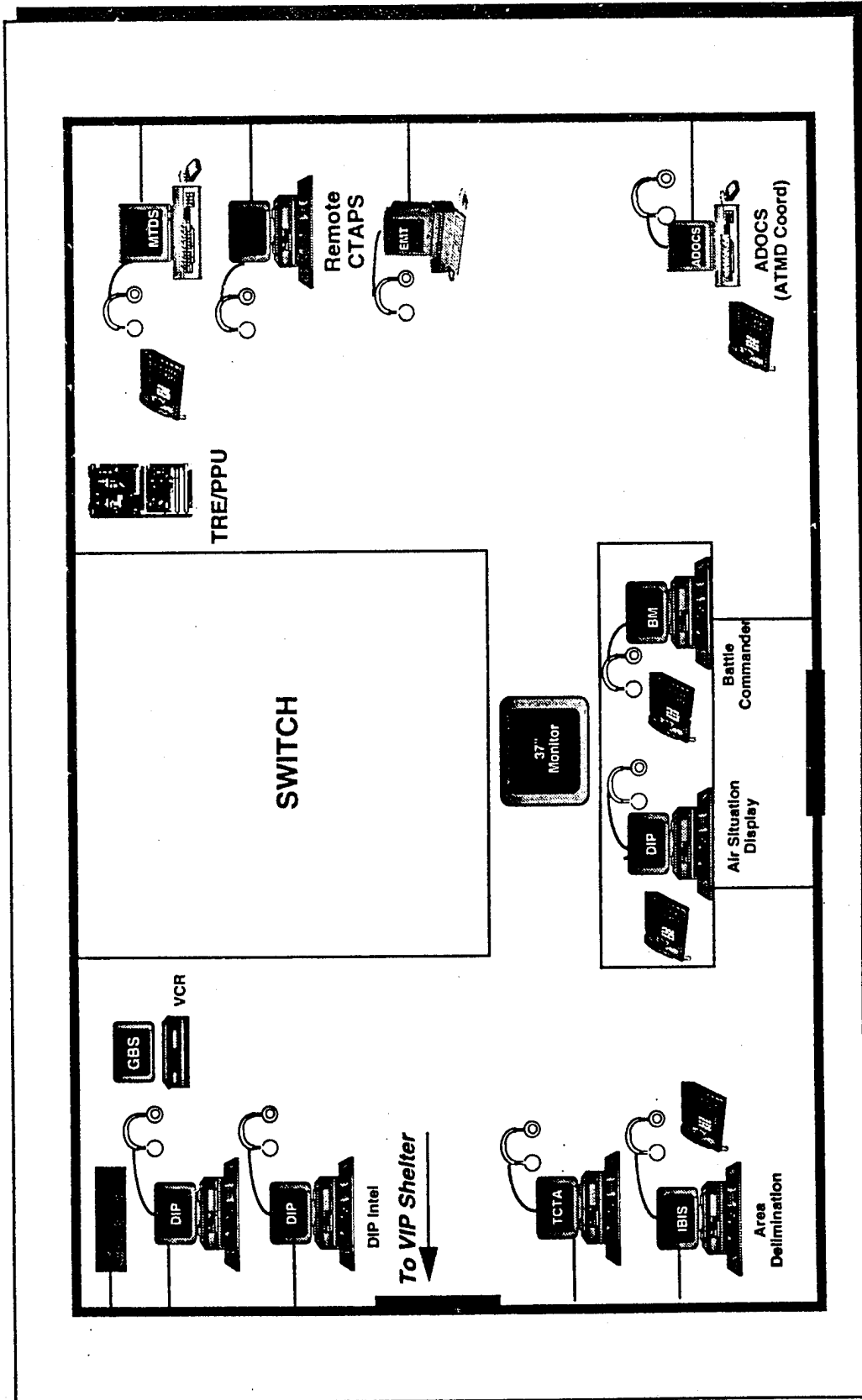


Figure 2

GBS: Global Broadcast System
 TCTA: Time Critical Target Aid
 DIP: Dynamic Intelligence Processors
 IBIS: Interactive Battlespace Intelligence System

BM: Battle Manager Workstation
 TRE/PPU: Satellite/Secure Comms Processor
 CTAPS: Contingency Theater Air Control
 Automated Planning System

MITRE

ENDNOTES

1. Durham, George A. "Developing TTP for Theater Missile Defense", Field Artillery, Ft. Sill, OK, September-October 1995, p.18.
2. Wagner, Louis C., Jr. "US Forces - Theater Missile Defense", Landpower Essay Series, No.94-9, AUSA Institute of Land Warfare, October 1994, p.2.
3. Joint Pub 3-01.5, Doctrine for Joint Theater Missile Defense, Washington, DC: US Government Printing Office, 30 March 1994, p. I-4.
4. IBID, p. III-1.
5. Vego, Milan N. "Fundamentals of Operational Design", an Unpublished Paper, Newport, RI: US Naval War College, July, 1995, p.7.
6. IBID, p.7.
7. IBID, p.7.
8. Joint Pub 3-01.5, p. II-1.
9. Keating, Jack. "Air Force-Army Theater Missile Defense (TMD) Battlespace Interoperability" (Briefing Slides), MITRE TMD Enclave Director, 26 September 1995, pp.9,24,27.
10. IBID, p.3 and US Army Space Command, "ATMDE Data" (Briefing Slides), August-September 1995.
11. Durham, p.19.
12. Pitts, James Edward. "Theater Ballistic Missile Defense: An Emerging Role for the Navy", Alexandria, VA: Defense Technical Information Center, December 1992, p.56.
13. Vego, "Fundamentals of Operational Design", p.17-18.
14. Joint Pub 3-01.5, p. II-7,8.
15. Jenkins, Harry W., Jr. "Theater Ballistic Missile Defense: The Enabler for Operational Maneuver from the Sea for the 21st Century", Marine Corps Gazette, Quantico, VA, Vol 79, No.7, July 1995, p.27.
16. Joint Pub 3-01.5, p. III-16.
17. Telephone Interview with Robert P. Smith, Jr. EUCOM-V Corps "Sensor-to-Shooter" Live-Fire Exercise Coordinator, Grafenwoehr Training Area, Germany, August 1993 and Fire Support Observer-Controller, US Army Battle Command Training Program (BCTP), Operations Group "A", Fort Leavenworth, KS, 1993-1995, Telephone Interview, 22 January 1996.

18. Vego, "Fundamentals of Operational Design", p.25.
19. Joint Pub 3-01.5, p. II-9.
20. Vego, "Fundamentals of Operational Design", p.13.
21. Garner, Jay. "Theater Missile Defense (TMD) and CINC's Experiments Program (Briefing Slides), Headquarters, US Army Europe (USAREUR): Deputy Chief of Staff for Operations and Plans, Force Developments Directorate, 1993, p.10.
22. Marsh, Greg and Sweitzer, W.F. "Space Issues", Joint Military Operations Lecture given as part of College of Naval Command and Staff curriculum, US Naval War College, Newport, RI, 22 January 1996.
23. Hilliard, Jay. "ATACMS Block II: Killing Armored Targets Deep", Field Artillery, Ft. Sill, OK, January-February 1996, pp.22.
24. Fogelman, Ronald R. "Theater Ballistic Missile Defense", Joint Forces Quarterly, Washington, DC: US Government Printing Office, Autumn 1995, p.78.
25. Locke, Walter M. and Werrill, Kenneth P. "Speak softly and...", Proceedings, US Naval Institute, October 1994, pp. 31,34.

Figure 1. Keating, p.16.

Figure 2. IBID, p.8.

Figure 3. IBID, p.5.

BIBLIOGRAPHY/REFERENCES

- Automated Deep Operations Coordination System (ADOCS), User's Manual (Draft), Arlington, VA: Interactive Television Company, June 1994.
- Canan, James W. "A Compelling National Requirement: Navy's Aegis System Front-Runner for Theater Ballistic Missile Defense Mission", Sea Power, Arlington VA, Vol 38, No.6, June 1995, pp. 37-40.
- Correll, John T. "Fogbound in Space", Air Force Magazine, Air Force Association, Vol 77, No.1, January 1994, pp. 22-29.
- Durham, George A. "Developing TTP for Theater Missile Defense", Field Artillery, Ft. Sill, OK, September-October 1995.
- Ellis, Michael W. and Record, Jeffrey. "Theater Ballistic Missile Defense and US Contingency Operations", Parameters, US Army War College, Spring 1992, pp. 11-26.
- Field Manual 6-20-10, Tactics, Techniques, and Procedures for The Targeting Process, Washington, DC: HQ, Department of the Army, 29 March 1990.
- Fogelman, Ronald R. "Theater Ballistic Missile Defense", Joint Forces Quarterly, Washington, DC: US Government Printing Office, Autumn 1995, pp. 75-79.
- Garner, Jay M. "Theater Missile Defense (TMD) and CINC's Experiments Program" (Briefing Slides), Headquarters, US Army Europe (USAREUR): Deputy Chief of Staff for Operations and Plans, Force Developments Directorate, 1993.
- Greenwald, Bryon E. "The History, Development, and Military Significance of Ballistic Missiles on Tactical Operations", Alexandria, VA: Defense Technical Information Center, 1995.
- Hilliard, Jay. "ATACMS Block II: Killing Armored Targets Deep", Field Artillery, Ft. Sill, OK, January-February 1996, pp. 22-24.
- Hood, Jay W. "Operational Fires and the Joint Force Commander," An Unpublished Paper, Newport, RI: US Naval War College, 16 June 1995.
- Hood, John T. "Navy Theater Ballistic Missile Defense: Cornerstone for 21st Century Joint Operations", Marine Corps Gazette, Quantico, VA, Vol 79, No.7, July 1995, pp. 32-34.
- Hughes, David. "Imaging Advances Leading to Real-Time Targeting", Aviation Week and Space Technology, McGraw-Hill, Inc., Vol 140, No.23, 6 June 1994, pp.46,63-64.

- Hutchinson, Scott T. "Army and Navy Theater Missile Defense: Protecting the Force", Military Review, Ft. Leavenworth, KS, Vol LXXV, No.2, March-April 1995, pp. 50-57.
- Jenkins, Harry W. Jr. "Theater Ballistic Missile Defense: The Enabler for Operational Maneuver from the Sea for the 21st Century", Marine Corps Gazette, Quantico, VA, Vol 79, No.7, July 1995, pp. 27-31.
- Joint Pub 2-0, Joint Doctrine for Intelligence Support to Operations, Washington DC: US Government Printing Office, 5 May 1995.
- Joint Pub 3-0, Doctrine for Joint Operations, Washington DC: US Government Printing Office, 1 February 1995.
- Joint Pub 3-01.5, Doctrine for Joint Theater Missile Defense, Washington, DC: US Government Printing Office, 30 March 1994.
- Joint Pub 3-09, Doctrine for Joint Fire Support, Washington, DC: US Government Printing Office, 2nd Draft, 10 March 1995.
- Joint Pub 6-0, Doctrine for Command, Control, Communications, and Computers (C4) System Support to Joint Operations, Washington DC: US Government Printing Office, 30 May 1995.
- Keating, Jack. "Air Force-Army Theater Missile Defense (TMD) Battlespace Interoperability" (Briefing Slides), MITRE TMD Enclave Director, 26 September 1995.
- Kroesen, Frederick J. "The Army in Space", Landpower Essay Series, No. 94-10, AUSA Institute of Land Warfare, October 1994.
- Locke, Walter M. and Werrill, Kenneth P. "Speak Softly and...", Proceedings, US Naval Institute, October 1994, pp. 30-35.
- Lingamfelter, L. Scott and Kirby, Robert D. "Stay Hot, Shoot Fast", Field Artillery, Ft. Sill, OK, April 1995, pp. 18-21.
- Marsh, Greg and Sweitzer, W.F. "Space Issues", Joint Military Operations Lecture given as part of College of Naval Command and Staff curriculum, US Naval War College, Newport, RI, 22 January 1996.
- Mc Dowell, Dennis. "Theater Missile Defense: A Joint Enterprise", Joint Forces Quarterly, Washington, DC: National Defense University, No. 3, Winter 1993-94, pp. 80-87.
- O'Neill, Malcolm R. "Ballistic Missile Defense: 12 Years of Achievement", Defense Issues, Washington, DC: Office of the Secretary of Defense, Vol 10, No. 37, 4 April 1995.

Otis, Glenn K. "Employing the Options: How a Joint Force Commander Views Roles and Missions", Landpower Essay Series, No. 94-7, AUSA Institute of Land Warfare, October 1994.

_____. "Long-Range Fires: Commanders' Options", Landpower Essay Series, No. 94-8, AUSA Institute of Land Warfare, October 1994.

Oxford, Donald G. "A Primer on the BCE", Field Artillery, Ft. Sill, OK, February 1995, pp. 27-30.

Pitts, James Edward. "Theater Ballistic Missile Defense: An Emerging Role for the Navy?", Alexandria, VA: Defense Technical Information Center, December 1992.

Rempt, Rodney P. "Killing Scuds from the Sea", Proceedings, US Naval Institute, June 1993, pp. 52-58.

Rigby, Randall L. "Fires for Division XXI: State of the Branch 1995", Field Artillery, Ft. Sill, OK, December 1995, p. 1-5.

Soofer, Robert M. "Joint Theater Missile Defense Strategy", Joint Forces Quarterly, Washington, DC: US Government Printing Office, Autumn 1995, pp. 70-74.

Telephone Interview with Tom Economy, PEO Missile Defense Assistant Division Chief for TMD Program and Technical Support, USA Missile Command, Redstone Arsenal AL, 1994-1995, 28 January 1996.

Telephone Interview with Dr. Steven Levin, President, Interactive Television Company (ITC), Arlington, VA, 5 December 1995.

Telephone Interview with Robert P. Smith, Jr., EUCOM-V Corps "Sensor-to-Shooter" Live-Fire Exercise Coordinator, Grafenwoehr Training Area, Germany, August 1993 and Fire Support Observer-Controller, US Army Battle Command Training Program (BCTP), Operations Group "A", Fort Leavenworth, KS, 1993-1995, 22 January 1996.

Tice, Jim. "The Deep Strike Revolution", Army Times, Springfield, VA, 9 October 1995, pp. 12,14.

_____. "Army's Battle Lab: Road Map to the Future", Army Times, Springfield, VA, 9 October 1995, pp. 13-14,16.

US Army Space Command. "Joint Warfare Interoperability Demonstration (JWID)", Briefing Slides, 1995.

_____. "ATMDE Data", Briefing Slides, August-September 1995.

_____. FACT SHEET, Subject: "Army Theater Missile Defense Force Projection Tactical Operations Center", USA Space Command (FWD), Public Affairs Office, Colorado Springs, CO, 1994.

V (US) Corps Field Standing Operating Procedures (SOP), Deep Operations Annex, Wiesbaden, Germany, April 1995.

Vego, Milan N. "Fundamentals of Operational Design," an Unpublished Paper, Newport RI: US Naval War College, July 1995.

_____. "Operational Functions," an Unpublished Paper, Newport, RI: US Naval War College, August 1995.

Walsh, Edward J. "Surface Warriors Chart Course to 2050", Sea Power, Arlington, VA, Vol 38, No. 12, December 1995, pp. 21-24.

Wagner, Louis C, Jr. "US Forces - Theater Missile Defense", Landpower Essay Series, No. 94-9, AUSA Institute of Land Warfare, October 1994.

White, Philip O. "The Role of the Army Tactical Missile System in Joint Warfare", Alexandria, VA: Defense Technical Information Center, 1993.

Wolf, James R. "Implications of Space-Based Observation", Military Review, Leavenworth, KS: US Army Command and Staff College, April 1994, pp. 75-85.

Zappalla, Steve. "Joint Theater Missile Defense", Alexandria, VA: Defense Technical Information Center, 1993.